September 29, 2000

MEMORANDUM TO: Janet R. Schlueter, Acting Chief
High-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards

FROM: William L. Belke, Sr. On-Site Licensing Representative
Repository Site Section
Division of Waste Management
Office of Nuclear Material Safety and Safeguards

Chad J. Glenn, Sr. On-Site Licensing Representative
Repository Site Section
Division of Waste Management
Office of Nuclear Material Safety and Safeguards

SUBJECT: U. S. NUCLEAR REGULATORY COMMISSION ON-SITE LICENSING REPRESENTATIVES' REPORT ON YUCCA MOUNTAIN PROJECT FOR JULY 1, 2000 THROUGH AUGUST 31, 2000

The purpose of this letter is to transmit the U.S. Nuclear Regulatory Commission (NRC) On-Site Representative's (OR's) report for the period of July 1, 2000, through August 31, 2000.

This report highlights a number of Yucca Mountain Project activities of potential interest to NRC staff. The OR's continue to respond to requests from NRC Headquarters staff to provide various documentation and feedback related to Key Technical Issues (KTIs) and their resolution. During this reporting period, the OR's continued to observe activities associated with Yucca Mountain Site Characterization, KTIs, and auditing. The OR's also attended a number of meetings and accompanied NRC staff on visits to Yucca Mountain.

If you have any questions on this report or its enclosures, please call William L. Belke on (702) 794-5047 or Chad J. Glenn on (702) 794-5046.

Enclosures: U.S. Nuclear Regulatory Commission On-Site Licensing Representatives Report
ESF/ECRB Plan View - Alcove, Niche and Boreholes Testing Locations
Early Warning Drilling Program Drillhole Locations

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U. S. NUCLEAR REGULATORY COMMISSION

ON-SITE LICENSING REPRESENTATIVES REPORT

NUMBER OR-00-04

FOR THE REPORTING PERIOD OF JULY 1, 2000 THROUGH AUGUST 31, 2000

/s/
William L. Belke
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Repository Site Section
High-Level Waste Branch
Division of Waste Management

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Repository Site Section
High-Level Waste Branch
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Enclosures

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REPORT DETAILS

1.0 EXECUTIVE SUMMARY

Quality Assurance, Engineering and Key Technical Issues

U.S. Nuclear Regulatory Commission (NRC) OPEN ITEM 99-1: Suppliers not including appropriate technical or Quality Assurance (QA) requirements in subtier supplier's documents. Initially documented in the August/September 1999 On-Site Licensing Representative's (OR) Report. Subsequent OR reviews identified a total of 20 examples. The above conditions are considered repetitive by the OR since they were previously documented as a deficient condition and subsequently closed by DOE as being corrected.

A U.S. Department of Energy (DOE) surveillance confirmed the initial OR observation for nine suppliers and sent a letter to these nine suppliers to inform them of this condition. After these nine suppliers were notified, DOE audits surfaced eleven more suppliers that were not incorporating appropriate technical or QA requirements in subtier supplier's documents.

DOE has informed the OR that a documented response is being prepared and should provide sufficient information to close this Open Item.

NRC OPEN ITEM 98-4: Technical data not always traceable to origin and the qualification status of the referenced data could not always be determined.

DOE issued Corrective Action Request (CAR) LVMO-99-001 on October 9, 1998. Corrective action established a multi-step checking process for those documents that will be used in site recommendation or licensing. This CAR was closed on August 2, 2000.

NRC OPEN ITEM 00-2: Length of time to close Nonconformance Reports (NCRs)

The OR review of the NCR log indicates that some NCRs have remained open almost four years. A similar NRC Open Item (98-1), initiated in January 1998 was reported closed in the March/April 2000, OR Report. Timely closure of an NCR is an important outcome of any QA program.

NCRs have not previously been coded into the DOE QA Trend Report for QA program deficiencies upon initiation as required by DOE procedure for all deficiency documents. Therefore, it is unclear what impact this practice has had on the accuracy of trending evaluations published in previous trending reports.

DOE has informed the OR that a documented response is being prepared and should provide sufficient information to close this Open Item. In addition, the Management and Operating Contractor has initiated actions to: 1) assign a responsible manager to each NCR; 2) determine the disposition of each NCR; and 3) establish a closure date for each NCR.

NRC OPEN ITEM 001-01: Software

DOE issued CAR LVMO-98-C-006 on February 10, 1998, for software development and configuration systems and processes being determined to be ineffective. During a January 2000 DOE QA audit, more problems surfaced in the area of software traceability qualification.

CAR-C-006, was closed in favor of issuing a new CAR LVMO-00-C-001 and four new Deficiency Reports to address the ineffectiveness of the M&O to implement the processes established. CAR LVMO-00-C-001 was closed on July 24, 2000, and therefore NRC Open Item 00-01 is closed.

Exploratory Studies Facility (ESF) & NRC Key Technical Issues

ESF/Enhanced Characterization of the Repository Block (ECRB) Testing

DOE continues efforts to maximize the amount of data available to support their Total System Performance Assessment - Site Recommendation (SR), Rev. 1. DOE's cut-off date for data/analyses to be considered in this revision is December 2000.

Seepage Testing

DOE seepage testing in the Topopah Spring middle nonlithophysal zone is nearing completion. Over this report period, seepage testing in the Topopah Spring lower lithophysal zone has been initiated and is expected to continue through FY2001. The Topopah Spring lower lithophysal zone represents over two-thirds of the potential repository horizon.

Passive Hydrologic Test

Since June 1999, steel bulkheads have cut off ventilation to the ECRB beyond Station 17+63. To date, in-situ moisture conditions have not been reached. Over this report period, DOE opened the bulkheads briefly to install drip indicators and to perform other work in support of this test. DOE closed the bulkheads and resumed testing after completing this work. DOE plans to continue this test through FY2001.

Cl-36 Validation Study

Testing to verify the presence of bomb pulse Chlorine-36 previously detected at the Sundance Fault and other locations continues. DOE reports that preliminary Tritium and Chlorine-36 analyses completed, to date, have not confirmed the presence of bomb pulse Chlorine-36; however, additional analyses await completion. Over this period, DOE proceeded with steps to determine if differences in sample preparation techniques, used by two different laboratories, might explain differences in analytical results from these laboratories. A final report on this study is expected to be submitted to DOE by the end of FY2001.

Thermal Testing

Over this period, DOE continued to reduce the power output to heaters to maintain drift wall-rock temperatures below 200° Centigrade in the Alcove 5 thermal test. The DOE/M&O completed Thermal Test Progress Report #5 in August 2000. DOE has deferred plans to conduct a new thermal test in the Topopah Spring lower lithophysal zone due to anticipated cuts in DOE's FY2001 testing program. The next DOE sponsored thermal test workshop is scheduled for October 5, 2000.

Fluid Inclusion Study

University of Nevada Las Vegas (UNLV) scientists are proceeding with a study to date the formation of fluid inclusions in calcite at Yucca Mountain. This study is presently expected to be completed in the Spring 2001 time frame. In response to a request by a State of Nevada scientist, an NRC/CNWRA scientist accompanied a State of Nevada scientist in locating previous NRC/CNWRA sample locations at Yucca Mountain. The State of Nevada scientist sampled a number of these locations in support of their work on fluid inclusions.

Surface-Based Testing

Waste Handling Building Geotechnical Investigation

DOE continued with a geotechnical investigation at the Yucca Mountain North Portal area to collect rock property and geophysical data for input to the design of a waste handling building for a potential repository at Yucca Mountain. The data collection portion of this work is expected to be completed by November 2000, and a final report is expected to be submitted to DOE by the June 2001 time frame.

Nye County Early Warning Drilling Program

Nye County continued their Phase II drilling program. Nye County drilled NC-EWDP-2DB to a total depth of 3075 feet successfully penetrating the carbonate aquifer at this location. In conjunction with a Nye County and DOE Cooperative Program, NC-EWDP-19D/D1 will be used for DOE's alluvial tracer testing. Over this report period, DOE conducted hydrologic testing in the alluvial section in NC-EWDP-19D/D1.

Busted Butte Unsaturated Zone Transport Test Facility

Phase II tracer testing will to continue through FY-2000. DOE presently plans to terminate tracer injection in early FY2001 and begin post-test characterization. Over this period, Atomic Energy of Canada, LTD. (AECL), continued radionuclide tracer testing on a block of tuff extracted from the Busted Butte Test Facility.

Engineered Barrier System (EBS)Testing

In September 2000, DOE expects to initiates two tests at their Pilot Scale Test Facility located in North Las Vegas. One test involves the restart of a column test using crushed tuff, and the second test is a pre-closure ventilation test.

REPORT DETAILS

2.0 INTRODUCTION

The principal purpose of the OR report is to inform NRC staff, managers, and contractors to information on the DOE programs for site characterization, repository design, performance assessment, and environmental studies that may be of use in fulfilling NRC's role during pre-licensing consultation. The principal focus of this and future OR reports will be on DOE's programs for the Exploratory Studies Facility (ESF), surface-based testing, performance assessment, data management systems, and environmental studies. Relevant information includes new technical data, DOE's plans and schedules, and the status of activities to pursue site suitability. The OR's also participate in activities associated with resolving NRC Key Technical Issues (KTIs). In addition to communication of this information, this report may raise potential licensing concerns, or express opinions; these items represent the views of the OR's. The reporting period for this report covers July 1, 2000, through August 31, 2000.

3.0 OBJECTIVES

The function of the OR mission is to principally serve as a point of prompt informational exchange and consultation and to preliminarily identify concerns about site investigations relating to potential licensing issues. The OR's accomplish this function by communicating, consulting and identifying concerns. Communication is accomplished by exchanging information on data, plans, schedules, documents, activities and pending actions, and resolution of issues. The OR's consult with DOE scientists, engineers, and managers with input from NRC Headquarters management on NRC policy, philosophy, and regulations. The OR's focus on such issues as QA, design controls, data management systems, performance assessment, and KTI resolution. A principal OR role is to identify areas in site characterization and related studies, activities, or procedures that may be of interest or concern to the NRC staff.

4.0 QUALITY ASSURANCE, ENGINEERING AND NRC KEY TECHNICAL ISSUES

The current listing and the progress of the NRC QA Open Items is listed below.

NRC OPEN ITEM 99-1 - QA/TECHNICAL REQUIREMENTS NOT INCORPORATED

BACKGROUND:

CAR-VAMO-98-C-005 was closed September 16, 1999. This CAR pertained to the M&O for failing to implement effective programs for the procurement of items and services, and for ineffective corrective actions at each of the affected organizations (National Laboratories, and U.S. Geological Survey). Part of the requirements for the M&O and affected organizations are to include requirements for the suppliers to incorporate the appropriate DOE Quality Assurance Requirements and Description (QARD) document requirements into any subtier supplier-issued procurement document. Also required was to ensure that all applicable QA/technical requirements were included into M&O procurement documents to suppliers. The DOE considered that the M&O initiated sufficient corrective actions to address this deficient condition and closed CAR VAMO-C-98-005 with respect to the M&O's procurement responsibilities that were passed on to the suppliers.

The OR review of DOE supplier audit/surveillance reports generated during the period of March - October 1999, indicated that there were problems with nine suppliers not including QA/technical requirements into their sub-tier supplier's documents. During the March-April 2000, and May-June 2000 OR reporting periods, the OR reviewed the supplier audit/surveillance reports for the period of November 1999 - May 2000. The results of this review revealed there were 11 more instances where the DOE auditors uncovered deficiencies, whereby suppliers were not incorporating applicable QA/technical requirements into procurement documents. From the OR's review of the supplier DOE audits/surveillances, the amount of suppliers encountering this problem totals up to 20 to date. Twelve conditions were noted during audits, three were from observations, and five were from surveys. Overall, the defect rate for this condition is in excess of 30%. This problem was initially reported by the OR in the August/September 1999 OR Report. DOE considered this an isolated instance because it only occurred once with each supplier to sub-tier supplier procurement. Based on the audit/surveillance findings, DOE considered the actual findings to be insignificant and did not warrant removal of the suppliers from the Qualified Supplier's List (QSL) and that overall, the DOE QA supplier audit program is working. Supplier audits/surveillance deficiencies are entered into the trending program data base for tracking purposes only, and hence these deficiencies are not trended. The trending program only applies to the deficiencies affecting and pertaining to the Office of Civilian Radioactive Waste Management (OCRWM) QA program and not to its suppliers.

Not incorporating appropriate QA/technical requirements into subtier supplier procurement documents appears to be a problem area with enough of the OCRWM qualified suppliers such that it may require attention and improved communication with all qualified suppliers. The NRC OR recommended in October 1999, that DOE issue a generic letter directing all suppliers to fully comply with the DOE QARD requirements (analogous to "lessons learned"). This would include special attention to ensure appropriate QA/technical requirements are included into suppliers and subtier suppliers procurement documents. A letter was issued three months later only to the nine suppliers identified in the September/October 1999, OR report and not the entire population listed on the QSL.

DOE considers this condition has no impact on the product or service produced. However, the OR considers this condition to potentially impact procurement efforts directed toward potential Site Recommendation (SR) or License Application (LA). Corrective action has not been effectively initiated and implemented for this condition. It appears to be a repetitive condition as partially noted in the above closed CAR VAMO-C-98-005.

CURRENT STATUS:
DOE has informed the OR that a documented response is being prepared and should provide sufficient information to close this Open Item.

98-4 TRACEABILITY

BACKGROUND:

(Ref: CAR LVMO-99-C-001)

As a result of the October 1998, DOE performance-based audit of the M&O, CAR LVMO-99-C-001 was issued on October 9, 1998. This CAR was issued because technical data referenced in Viability Assessment technical documents were not traceable to the origin, and the qualification status of referenced data could not always be determined.

The corrective action established a multi-step checking process to review and evaluate a given list of documents to be used in support of SR/LA. Those documents identified will be corrected or replaced as applicable. Documents identified that will not support SR/LA will have no remedial action taken and justification for this decision will be documented.

CURRENT STATUS:

This CAR was originally scheduled for completion by December 30, 1999. However, AP-3-10Q, "Analyses and Models" required additional revisions to satisfactorily close the CAR. This CAR was closed on August 2, 2000. Open Item 98-4 is now considered closed.

NRC OPEN ITEM 00-2 - LENGTH OF TIME TO CLOSE NONCONFORMANCE REPORTS (NCRs)

BACKGROUND:

The OR review of the DOE NCR log and tracking system runoff indicated an example of an NCR remaining open nearly four years and other examples of NCRs open over two years. A similar NRC review (Open Item 98-1) of the CAR and DRs reported in the January/February 1998 OR Report, noted that these deficiencies remained open well in excess of one year. NRC Open Item 98-1 was closed in the March/April 2000 OR Report which noted significant improvements in timely closure for these types of deficiencies.

NCRs provide the vehicle for documenting nonconforming items, samples, and products both subject to and not subject to the requirements of the Office of Civilian Radioactive Waste Management Quality Assurance Requirements and Description document ("Q" and non-"Q"). It is recognized that certain of these NCRs may not have a high degree of safety significance. However, the large number of NCRs remaining open for extended periods of time, do not meet the full intent of the requirements of Title 10 of the Code of Federal Regulations (10 CFR), Part 60, Subpart G (which references 10 CFR Part 50, Appendix B). Criterion XVI of Appendix B requires in part, "...nonconformances are promptly identified and corrected."

This issue was briefly discussed with DOE and it was noted that closing some of the issues are not of the utmost priority due to lack of safety significance and budgetary constraints. DOE also noted that with recent improved communication efforts, NCR closure times have improved.

The process for controlling the issuance and control of NCRs is delineated in Yucca Mountain Site Characterization Project Procedure YAP-15.1Q, "Control of

Nonconformances." Unlike Administrative Procedure AP-16.1Q for activities subject to QA program controls, YAP-15.1Q does not provide specific requirements on establishing an agreed upon timely closure date and an extension date if necessary, by the involved responsible individuals for a particular deficiency. Also, unlike AP-16.1Q, YAP-15.1Q does not describe provisions which assign individuals to be accountable for closure. YAP-15.1Q rather assigns the "responsible organization" for further action.

The above condition could potentially have an impact on efforts directed toward potential SR. The OR recommends that YAP-15Q be reviewed for possible improvements.

CURRENT STATUS:
DOE has informed the OR that a documented response is being prepared and should provide sufficient information to close this Open Item. In addition, the Corrective Action Board Meeting Minutes indicate that the Management and Operating Contractor has initiated actions to: 1) assign a responsible manager to each NCR; 2) determine the disposition of each NCR; and 3) establish a closure date for each NCR.

TRENDING REPORT
The DOE Trending Report dated August 10, 2000, for the period of January 1, 2000 through June 30, 2000, has been released. Some statements in this report appear to require additional clarification.

The Trending Report recognizes that upon initiation of an NCR in the past, it was not included in the trending process as required for all deficiency documents. It is unclear what impact this practice has had on the accuracy of trending evaluations published in previous trending reports. If this practice had no adverse impact on the previously reported trending analysis, the OR questioned how this practice was evaluated and determined.

Due to the nature of the current work being performed, most of the NCRs are not of a significant nature. Should they have been of a significant nature, the deficient condition would have been processed and resolved through the CAR process. However, there does not appear to be a methodology as there is with CARs and DRs, to sort and determine the relative category and importance for NCRs. Therefore, the OR recommends that as the current NCR program undergoes revision, consideration be given to enhancing the NCR program to develop a methodology for sorting and categorizing NCRs in their relative order of importance. This suggested sorting process will more accurately reflect the true nature of the trending process.

Section 2.0 of this Trending Report says that the trend data includes deficiencies identified from 53 NCRs. However, the computer NCR printout from June 28, 2000, lists 75 NCRs, for a delta of 22 NCRs that do not appear to be included for that period. A discussion with the Trending Coordinator revealed that the NCR program is being revised and updated and in the future, will capture the total population of all NCRs in a more accurate manner.

Section 3.0 on page 6 of the report states, "Again, as had been reported in the last trend report the supplier deficiencies were not as a result of a failure to include the requirements in the customer procurement documents and not a repeat of CRWMS M&O procurement problems." This statement appears to be inconsistent with the

statement for the deficient condition identified in CAR VAMO-98-C-005 (closed 9/13/99) that, "Consequently, SNL failed to pass QA requirements on to SINCO, a supplier of calibration services." In any event, it is unclear whether the corrective action initiated and intended to resolve the procurement deficiencies problems in CAR-005 are effective since procurement deficiencies continue to surface.

SOFTWARE

BACKGROUND:

On February 10, 1998, CAR LVMO-98-C-006 (open 750 days) was initiated for software development and configuration systems and processes being determined to be ineffective. This CAR identified deficiencies related to the M&O software programs that were developed and used for quality-related activities throughout the project without the required software life cycle baseline controls. The CAR also identified that some of the M&O software programs had not been properly identified or placed under the necessary configuration management program.

During January 24-28, 2000, DOE QA audit of the Unsaturated Zone Flow and Transport Model Report, more problems in the area of software traceability and qualifications surfaced. The audit determined that control, qualification and application of software through the implementation of procedures AP-SI.1Q (Software Management) and AP-3.10Q (Analyses and Models) was ineffective. This is particularly important because AP-SI.1Q was previously identified as the principal measure to prevent recurrence. DOE therefore, determined that the process established for software management is ineffective. DOE completed its verification of the corrective actions for CAR LVMO-98-C-006 and determined that all actions were completed. However, the M&O did not effectively implement APSI-1Q which was committed to as an action to prevent recurrence of CAR LVMO-98-C-006. The continuing implementation deficiencies were incorporated into four deficiency reports and CAR LVMO-00-C-001 was issued. Based on these actions, CAR LVMO-98-006 was closed.

CURRENT STATUS:

CAR-LVMO-00-C-001 was closed on July 24, 2000, and therefore, NRC Open Item 00-01 is closed. The NRC will continue to monitor the effectiveness of the corrective action implementation.

5.0 EXPLORATORY STUDIES FACILITIES (ESF), AND NRC KEY TECHNICAL ISSUES

Enhanced Characterization of the Repository Block (ECRB)

DOE continues ECRB construction and testing activities to maximize the amount of data available to support DOE Total System Performance Assessment (TSPA) - Site Recommendation Rev.1. DOE's cut-off date for data/analyses to be considered for this revision is December 2000. Enclosure 2 provides ESF and ECRB test locations.

The excavation of the ECRB, completed on October 13, 1998, allows the collection of scientific and engineering data in stratigraphic units that constitute the bulk of the potential repository horizon. ECRB construction and testing activities are summarized below.

Passive Hydrologic Test

BACKGROUND:

Since June 1999, two sections of the ECRB have been isolated from the rest of the underground facility by the construction of sealed bulkheads. These bulkheads are located at Stations 17+63 and 25+03. No forced ventilation occurs beyond the bulkheads, except during brief entries to collect data and perform maintenance. This is a passive test designed to allow the isolated parts of the ECRB to return to ambient (pre-construction) moisture and temperature conditions to determine if dripping from the rock-mass can be observed. Hundreds of moisture monitoring probes were previously placed in the tunnel walls at depths of up to 2 meters. While some test probes in this sealed off area show evidence of rewetting, DOE scientists state that moisture conditions in this section of the ECRB have not fully re-equilibrated.

CURRENT STATUS:
DOE completed additional work in support of this test. This work included the installation of: 1) drip indicators (pH treated cloth) and additional moisture monitoring instrumentation; 2) a third bulkhead (Station 26+00) between the Tunnel Boring Machine and Solitario Canyon Fault; and, 3) new wiring to better control lighting in this section of the ECRB. This work was completed over a period of several weeks, and all three bulkheads were closed on August 2nd. DOE currently plans to continue this test through FY2001.

Niche #5
BACKGROUND:
This niche is constructed at Station 16+20 to conduct seepage testing in the Topopah Spring lower lithophysal zone. Over two-thirds of the potential repository is planned to be located in this rock unit. Niche walls and boreholes have been instrumented with moisture monitoring equipment. Test results will feed the unsaturated zone flow and transport process model report.

CURRENT STATUS:
A sealed bulkhead was constructed at the entrance of this niche. DOE scientists continue preparations to begin Seepage Threshold Testing in September 2000. This testing is expected to continue through FY2001.

Systematic Hydrologic Characterization (SHC)
BACKGROUND:
DOE scientists are conducting SHC testing to investigate the spatial variability of hydrologic properties affecting seepage processes induced by the introduction of large amounts of traced water at different distances above the ECRB drift. DOE is drilling a number of boreholes in the Topopah Spring lower lithophysal zone between Stations 14+44 and 17+63. The boreholes are used for air permeability and liquid release testing in percolation and seepage studies. Test results will feed the near-field and unsaturated zone flow and transport process model reports.

CURRENT STATUS:
DOE drilled and conducted SHC testing in several boreholes. SHC testing is planned in approximately 20 boreholes. DOE has approved funding to continue this testing through FY2001.

Alcove 8:
BACKGROUND:

This alcove is constructed at Station 8+00 to conduct seepage testing from the Topopah Spring upper lithophysal zone to the underlying Topopah Spring middle nonlithophysal zone. DOE completed drilling a series of boreholes downward from this alcove for moisture monitoring. Niche #3, previously constructed in the Topopah Spring middle nonlithophysal zone, is situated directly below this alcove and will be used in this test. An infiltration system will be constructed on the floor of Alcove 8 and traced water applied at a measured rate. Boreholes in Alcove 8 and Niche #3 will be used to monitor changes in moisture content and other properties of the rock-mass. DOE scientists plan on monitoring these boreholes using ground penetrating radar, neutron logging, and acoustic tomography. Test results will feed near field and unsaturated zone flow and transport process model reports.

CURRENT STATUS:
DOE constructed a bulkhead at the entrance of this alcove. Geophysical logging of boreholes was also conducted to collect baseline data before the start of this testing. Two infiltration plots have been constructed on the floor of this alcove. One plot is approximately 1 X 1 meter, and the second plot is approximately 3 X 4 meters. DOE scientists expect to begin testing on the small plot in September 2000 and continue seepage testing through FY2001.

Cross Drift Drainage Benches
BACKGROUND:
Four drainage benches have been excavated and testing initiated. Drainage bench sites correspond to locations used in DOE's small scale fracture study. These 1 meter X 1 meter X 0.5 meter high benches are designed to characterize fracture properties for evaluation of seepage and drift drainage. A constant head infiltrometer (approximately 60 centimeters in diameter) is mounted on the surface of each bench. Traced water is applied to the surface of these benches to determine the infiltration rate and flow path of water through the rock mass.

CURRENT STATUS:
Testing continued at drainage benches located at Stations 17+35, 15+20, 11+15 and 13+00. DOE currently plans to terminate this testing at the end of FY2000.

Cross Drift Thermal Test (CDTT):
CURRENT STATUS:
DOE continued planning a thermal test in the Topopah Spring lower lithophysal zone at Station 16+95. A draft CDTT plan was completed in early August 2000. However, in late August, DOE reported that the CDTT will not be funded for FY2001 due to anticipated cuts in DOE's testing program.

EXPLORATORY STUDIES FACILITY (ESF) TESTING

Moisture and post-construction monitoring continue. ESF testing activities are summarized below.

CHLORINE-36 VALIDATION STUDY
BACKGROUND:

DOE scientists are proceeding with a study to validate the presence of bomb-pulse chlorine-36 at two locations in the ESF. DOE scientists completed the collection of approximately 60 samples in the vicinity of the Drill Hole Wash Fault and the Sundance Fault where elevated concentrations of chlorine-36 were detected in a previous study. These samples are being analyzed for chlorine-36, tritium, technetium-99, and supplemented by analyses of uranium, thorium, iodide-129 and radium isotopes.

To date, this validation study has detected no elevated chlorine-36 values; however, additional samples await analyses. According to DOE scientists, one possible explanation for the apparent disagreement between results of this study and an earlier study may lie in sample preparation and processing techniques. One of the two laboratories involved is thought to use a more aggressive crushing technique which may release more rock chloride thus reducing the ratio of chlorine-36 to chlorine. To determine the effect of two different sample preparation and processing techniques, a bulk sample has been collected from the ECRB and prepared for analyses.

CURRENT STATUS:
The bulk sample was split and shipped to the two laboratories involved in the chlorine-36 studies. The laboratories plan to document testing of the effect of different leaching procedures on the release of rock chloride. After this testing, the laboratories will agree to a recommended standard processing method to apply to the test sample and to validation samples. The USGS continues to perform tritium analyses of water extracted from chlorine-36 cores. According to DOE scientists, tritium analyses have been completed on 40 of the 50 cores from the Sundance Fault anomaly, and only one analysis exceeded the tritium detection limit. DOE has approved funding to continue this work in FY2001. A final report on this study is expected to be completed by the end of FY2001.

Alcove 1:
DOE scientists completed the final phase infiltration test at this location and no further testing is planned. DOE scientists are preparing final data packages for submittal to the Technical Data Management System.

Alcove 2:
This alcove serves as a Yucca Mountain display center for ESF visitors. There is no further testing planned in this alcove.

Alcoves 3 and 4:
DOE scientists continued to collect data from moisture monitoring instrumentation (tensiometers) in two 30 meter deep boreholes in the Paintbrush nonwelded tuff unit. A downward looking borehole from Alcove 3 captures the upper section of this unit, and a downward looking borehole from Alcove 4 captures the lower section of this unit. Data from these instruments are expected to help develop a better understanding of the moisture characteristics of the Paintbrush nonwelded tuff unit. This testing is presently not funded for FY2001.

Alcove 5 (Thermal Testing Facility Access/Observation Drift, Connecting Drift, and Heated Drift)
BACKGROUND:

DOE initiated the heating phase of this test on December 3, 1997. The four-year heat-up phase will be followed by a four-year cool-down phase. Heat generated by nine electrical floor heaters and 50 electrical wing heaters simulate heat from emplaced waste. This test is designed to heat approximately 15,000 cubic meters of rock in the proposed repository horizon to 100° Centigrade (212° Fahrenheit) or greater to investigate coupled thermal-hydrologic-mechanical-chemical processes. These processes are monitored by approximately four thousand sensors positioned in 147 radial boreholes around the heated drift. A data collection system records measurements from these sensors.

CURRENT STATUS:
DOE scientists lowered the power output to heaters for the third time to maintain drift wall-rock temperatures below 200° Centigrade (392° Fahrenheit). DOE plans to hold these wall-rock temperatures for approximately 2 years to evaluate the effect of sustained heating on the hydrologic, chemical and mechanical behavior of the rock. On August 24, 2000, sensors in the heated drift recorded the following preliminary temperatures: canister temperature of 197.8° Centigrade (388° Fahrenheit), rock-mass surface temperature of 193.9° Centigrade (381° Fahrenheit), and air temperature of 198.3° Centigrade (389° Fahrenheit). There were no water chemistry samples collected from monitoring boreholes over this reporting period because there was insufficient water in sampling intervals. In August 2000, DOE/M&O completed Thermal Test Progress Report #5. The next DOE sponsored thermal test workshop is scheduled for October 5, 2000, at Lawrence Berkeley National Laboratory.

Alcove 6 (Northern Ghost Dance Fault Alcove):
Over this reporting period, there was no new testing conducted or planned in this alcove.

Alcove 7 (Southern Ghost Dance Fault Alcove)
BACKGROUND:
Excavation of this alcove cut the Ghost Dance Fault at station 1+67. Since November 1997, water-potential data has been collected from 51 probes in the rock mass surrounding Alcove 7, and 8 surface-based probes in soil within and adjacent to the Ghost Dance Fault zone. This instrumentation is designed to measure natural infiltration at the surface and changes in temperature, pressure, and moisture conditions in the rock-mass around this alcove. Drip indicators (pH treated cloth) are also installed to detect any seepage in this alcove.

CURRENT STATUS:
DOE scientists continue to collect surface infiltration and moisture data in and around this alcove. To date, DOE scientists report no seepage from the rock-mass in this alcove.

Niche #1 (35+66), Niche #2 (36+50), Niche #3 (31+07), and Niche #4 (47+87)
BACKGROUND:
These niches have been excavated in the Topopah Spring middle nonlithophysal zone. In 1998, investigators completed drift seepage threshold testing in Niche #2. In 1999, DOE scientists completed water release tests at Niche #3. No further work is planned for Niches #1, #2. Niche #3 will be used to monitor seepage testing in Alcove 8.

CURRENT STATUS:
Seepage testing continued in Niche #4. Niche #4 testing is expected to be completed by the end of FY2000.

Fluid Inclusion Study
BACKGROUND:
University of Nevada Las Vegas (UNLV) scientists are proceeding with a study to date the age of fluid inclusions found in calcite at Yucca Mountain. The characterization of over 150 samples collected from the ESF and ECRB continues in an effort to better understand the development of secondary minerals and spatial distribution of fluid inclusions. This study is currently expected to be completed in the Spring 2001 time frame.

CURRENT STATUS:
A State of Nevada scientist expressed an interest in sampling previous NRC/CNWRA sample locations for the State's ongoing investigation of fluid inclusions. On August 31, 2000, NRC/CNWRA and State of Nevada scientists met to visit these sample locations in the ESF/ECRB. The State of Nevada scientist sampled a number of these locations.

Laser Strainmeter Test
BACKGROUND:
Under a cooperative agreement with the Yucca Mountain Site Characterization Office, the University of California, San Diego will install and monitor a long-baseline strainmeter (LSM) in the ESF. The LSM experiment will supplement Global Positioning System surveys conducted at five sites in the Yucca Mountain area from 1991 to 1997, which indicated higher crustal elongation rates (strain rates) than those indicated by the volcanic and tectonic history of the region. The general test description consists of the installation and operation of the LSM along the South Ramp of the ESF. A laser will measure the distance between two end monuments. The laser path will be through a vacuum tube approximately 500 meters long on the right rib of the South Ramp between Stations 65+00 and 70+00.

CURRENT STATUS:
DOE developed work instructions for fielding this test. Construction of instrumentation niches and testing assemblies is expected to start in September 2000.

<u>Surface-Based Testing</u>

Nye County Drilling and Testing
BACKGROUND:
Phase II (FY2000) of the Nye County drilling and testing program continued over this period. Completed Phase II wells include the following: NC-EWDP-4PA and 4PB, NC-EWDP-7S, NC-EWDP-5SB, and NC-EWDP-19D/D1. Nye County also prepared to drill several deep wells by installing surface casing for NC-EWDP-2DB, NC-EWDP-3DB, NC-EWDP-12D, and NC-EWDP-15D. Phase III (FY2001) drilling plans are presently under consideration. Enclosure 3 shows the location of planned and completed well locations.

CURRENT STATUS:

Nye County drilled NC-EWDP-2DB to determine the depth to Paleozoic rocks at this location. According to Nye County, Paleozoic rocks were encountered at a depth of approximately 2865 feet. Nye County drilled this well to a total depth of 3075 feet. Hydrologic testing and sampling of the carbonate aquifer is planned.

Alluvial Tracer Complex (ATC)
BACKGROUND:
The ATC is a joint Nye County and DOE Cooperative Program to investigate flow and transport properties of the saturated alluvium and volcanic interface. The ATC test will be conducted at well NC-EWDP-19D/D1 and include both hydrologic and single well tracer injection testing. Nye County drilled 19D/D1 to a depth of 1438 feet and encountered water at 366 feet and volcanic rocks at 810 feet. This well was completed to isolate six water bearing zones (4 in alluvium and 2 in volcanic rocks). Nye County instrumented wells NC-EWDP-4PA, 4PB, 19P, 15P and Washburn to monitor ATC hydrologic testing.

CURRENT STATUS:
DOE completed hydrologic testing in the upper 4 saturated alluvial units in this well. This test was conducted from July 7-14th. Over the course of this test, the well was pumped at a rate of 150 gpm, resulting in 108 feet of drawdown (uncorrected for earth tides and atmospheric influences) after 7 days of pumping. According to DOE scientists, NC-EWDP-19P was the only monitoring well affected (drawdown of 0.6 feet) by this testing. According to DOE scientists, preliminary results suggest that the alluvial units tested at this location are less transmissive than originally expected.

On August 25th, DOE initiated Isolated-Interval Hydraulic Test #1 in the lowermost alluvial zone. This interval was pumped at a rate of approximately 80 gpm, resulting in 50 feet of drawdown after 7 days of pumping. This test was completed on August 31, 2000.

Waste Handling Building Geotechnical Investigation
BACKGROUND:
DOE is conducting a geotechnical investigation at the Yucca Mountain North Portal area to collect data for the design of a waste handling building for a potential repository. This activity involves drilling a series of boreholes and excavating trenches/test pits to further characterize this area. Geophysical data will be collected to obtain shear wave and compression wave velocities. DOE also plans to characterize near surface velocity over the potential repository using surface wave recordings generated by explosions in three boreholes on the crest of Yucca Mountain.

CURRENT STATUS:
DOE completed drilling and initiated geophysical logging in 6 (RF-16, RF-26, RF-22, RF-17, RF-24, and RF-28) of approximately 15 shallow boreholes. The excavation and field testing of 3 test pits to obtain soil density data was also completed. Geologic logs and maps are under development. Field work for this investigation is expected to be completed by November 2000. A final report is expected to be submitted to DOE by June 2001.

Busted Butte Unsaturated Zone Transport Test
BACKGROUND:

The planned hydrologic and tracer testing at Busted Butte is designed to provide data to help model the travel of radionuclides in the unsaturated zone under the proposed repository. This underground facility includes a 72.5 meter main drift and 19 meter test alcove. The test is fielded in the base of the Topopah Spring non-to-partly-welded vitric sub-zones and the top of the Calico Hills Formation. Phase I tracer testing was completed in 1998.

CURRENT STATUS:
Phase II tracer injection continued in a separate 10 X 10 X 6 meter block of rock exposed in this underground facility. Tracer injection is expected to continue through FY2000. In early FY2001, DOE plans to stop tracer injection and begin post-test characterization work. This work includes: overcoring selected injection boreholes, partial mine-back of the block, and rock sampling and analyses to better characterize the distribution of reactive and nonreactive tracers. Early results of this testing are documented in a report on unsaturated zone/saturated zone transport properties, which was completed in August 2000. Atomic Energy of Canada, LTD., (AECL), continues radionuclide transport testing on blocks of rock extracted from the Busted Butte Test Facility.

Engineered Barrier System (EBS) Testing

The Engineered Barrier System Operations (EBSO) Office of the Yucca Mountain Project continues to perform EBS testing. The EBS tests are performed in a Pilot Scale Test Facility located in North Las Vegas. Test results feed the EBS degradation and transport process model report.

Pilot Scale Testing

Pre-closure Ventilation Test
BACKGROUND:
DOE's System Design Description for the emplacement drift system states that the subsurface ventilation will remove 70 percent of the heat generated by the waste packages during pre-closure. DOE is preparing to conduct a pre-closure ventilation test in the EBS test facility. The objectives of this test are to (1) develop data to support the design of the ventilation system for the potential repository to maintain sub-boiling emplacement drift temperatures; and (2) provide data to support computer models used for ventilation calculations.

CURRENT STATUS:
DOE continued with the installation of equipment and instrumentation for this test. This testing is expected to start in September 2000, and conclude by the end of FY2001.

Column Testing
BACKGROUND:
In December 1999, DOE started column testing using crushed tuff. This testing is designed to replicate a previously reported test by Rimstidt (Rimstidt and Williamson 1991). The purpose of this testing is to determine the potential changes in permeability due to Thermal Hydrologic Coupled (THC) effects in backfill/invert materials.

To date, three column tests have been initiated, however equipment and contamination difficulties have delayed the completion of this testing. It is the OR's understanding, that preliminary results of this testing suggest THC effects may result in a large decrease in the permeability of crushed tuff.

CURRENT STATUS:
DOE continued planning the restart of this testing. According to DOE, this test is presently on hold pending the procurement of high quality carbon dioxide gas. DOE is presently in the process of procuring this gas and expects to restart this test in September 2000.

6.0 GENERAL

1. Appendix 7 Interactions:
   On July 5, 2000, the OR and several NRC Headquarters contractor staff visited the Yucca Mountain facilities.

   On August 16, 2000, the OR, several NRC Headquarters and CNWRA staff met with DOE to discuss fracture data and its use in DOE's design and performance assessment. This meeting was an information exchange in preparation for the October 11-13, 2000 Technical Exchange on Structural Deformation and Seismicity.

   On August 17, 2000, the NRC Deputy Director of the Division of Waste Management, a representative from the Office of State Programs, and the OR's visited the Yucca Mountain facilities.

   On August 24, 2000, the OR's were briefed on DOE's Integrated Safety Management System and its implementation on the Yucca Mountain Project.

   On August 28, 2000, a representative from the NRC Region IV office in Arlington, Texas, a temporary Japanese assignee to the NRC high-level waste staff, and the OR's visited the Yucca Mountain facilities.

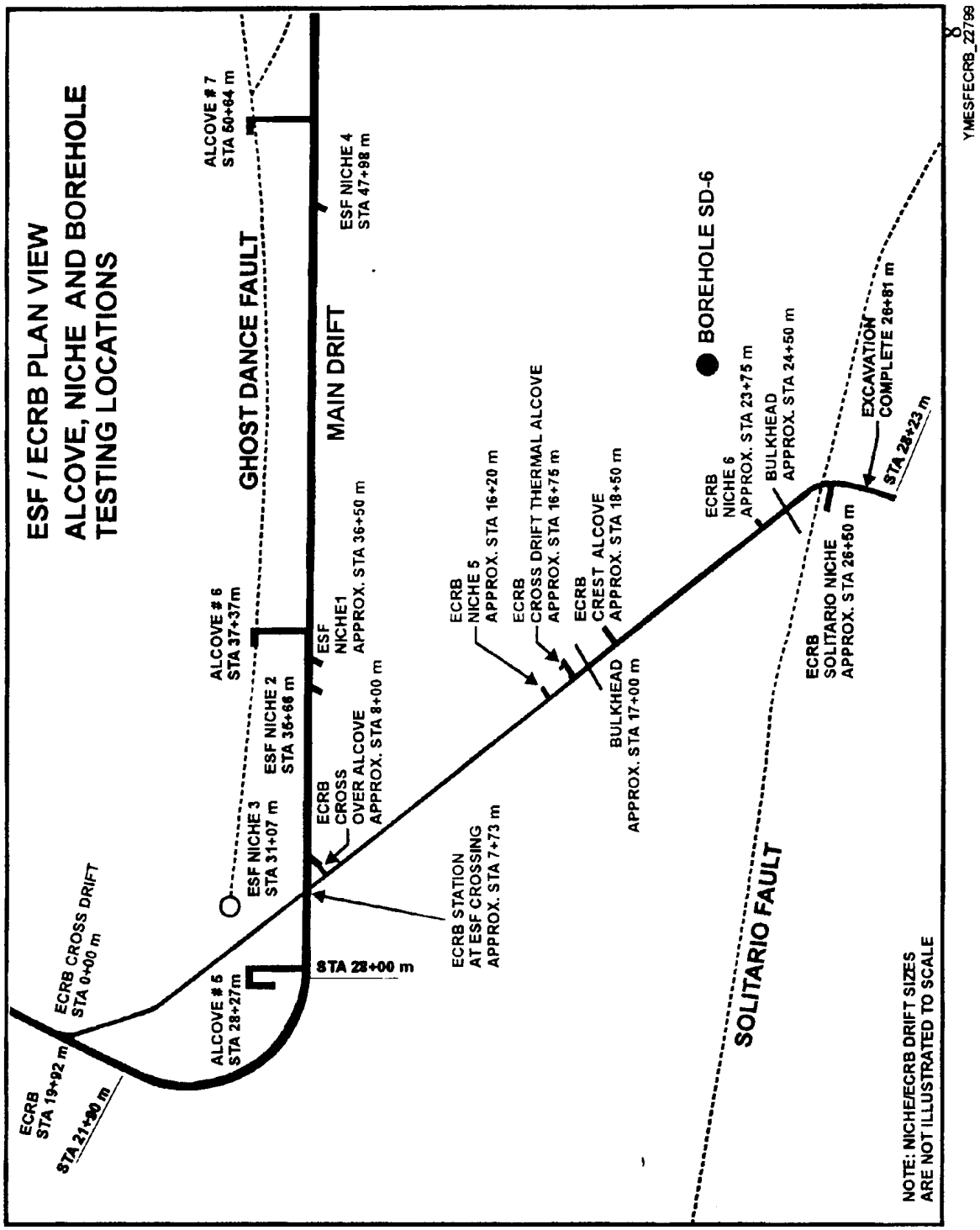
The purpose of the site visits were to obtain an overview of DOE's Yucca Mountain site characterization activities. There were no outstanding issues raised as a result of these visits.

2. Other
   On July 13, 2000, the NRC Chairman, NRC Executive Director of Operations, NRC Director of Public Affairs, NRC Director of the Division of Waste Management, NRC Chairman's Technical Assistant, and the OR's visited the Yucca Mountain facilities.

   On July 14, 2000, the OR's attended the meeting held between the NRC Chairman, and various members of the Affected Units of Government, State of NV, Native Americans, the NV Legislative Bureau in Las Vegas, NV, and other interest groups. The purpose of this meeting was to discuss various group areas of interest relating to Yucca Mountain.

On August 1-2, 2000, an OR attended the U.S. Nuclear Waste Technical Review Board meeting in Carson City, NV. Discussions in this meeting focused on the Total System Performance Assessment supporting DOE's Site Recommendation Consideration Report.

On August 15-16, 2000, the OR's attended public meetings in Las Vegas and Pahrump, Nevada, concerning the NRC's recently completed NUREG 6672, "Reexamination of Spent Fuel Shipment Risk Estimates," and the results of Phase 1 of the Package Performance Study. The purpose of these meetings was to obtain further public input into the proposed update of a 1987 study that examined the adequacy of spent nuclear fuel transportation casks to withstand sever accidents. The meetings were conducted by the NRC's Spent Fuels Project Office staff, with assistance from Sandia National Laboratories, involved both roundtable and general public discussions that included a broad spectrum of views representing citizen and environmental groups, state and local governments, industry and transportation. These meetings were successful in obtaining constructive comments which will be considered during the staffs reexamination of spent fuel shipping containers.


ESF / ECRB PLAN VIEW
ALCOVE, NICHE AND BOREHOLE
TESTING LOCATIONS
GHOST DANCE FAULT
MAIN DRIFT
BOREHOLE SD-6
SOLITARIO FAULT
ECRB CROSS DRIFT STA 0+00 m
ECRB STA 19+92 m
STA 21+90 m
ALCOVE # 5 STA 28+27m
ECRB STATION AT ESF CROSSING APPROX. STA 7+73 m
STA 22+00 m
ESF NICHE 3 STA 31+07 m
ALCOVE # 6 STA 37+37m
ESF NICHE 2 STA 35+66 m
ECRB CROSS OVER ALCOVE APPROX. STA 8+00 m
ESF NICHE1 APPROX. STA 36+50 m
ALCOVE # 7 STA 50+84 m
ESF NICHE 4 STA 47+98 m
ECRB NICHE 5 APPROX. STA 16+20 m
ECRB CROSS DRIFT THERMAL ALCOVE APPROX. STA 16+75 m
ECRB CREST ALCOVE APPROX. STA 18+50 m
BULKHEAD APPROX. STA 17+00 m
ECRB NICHE 6 APPROX. STA 23+75 m
BULKHEAD APPROX. STA 24+50 m
ECRB SOLITARIO NICHE APPROX. STA 26+50 m
EXCAVATION COMPLETE 26+81 m
STA 28+23 m
NOTE: NICHE/ECRB DRIFT SIZES ARE NOT ILLUSTRATED TO SCALE
YMESFECRB_22799

Enclosure 2

NYE COUNTY, NEVADA
EARLY WARNING DRILLING PROGRAM
DRILLHOLE LOCATIONS
Phase I Drillholes
Phase II Drillholes
Phase II Monitoring Wells
Phase II Injection Well
Phase III Drillholes
NEVADA TEST SITE
CRATER FLAT
AMARGOSA DESERT
NC-EWDP-1D
NC-EWDP-1S
NC-EWDP-7S
NC-EWDP-9S
NC-EWDP-12D
NC-EWDP-12PA
NC-EWDP-12PB
NC-EWDP-13S
NC-EWDP-16S
NC-EWDP-18S
NC-EWDP-3D
NC-EWDP-3DB
NC-EWDP-3S
NC-EWDP-15D
NC-EWDP-15P
NC-EWDP-19P, 19M1, 19M2, 19M3, 19I1
NC-EWDP-19D (Pump Well)
NC-EWDP-2D
NC-EWDP-2DB
NC-Washburn -1x
NC-EWDP-4PA
NC-EWDP-4PB
NC-EWDP-5S
NC-EWDP-5SB
NC-EWDP-6D
NC-EWDP-17S
NC-EWDP-20D
NC-EWDP-10S
NC-EWDP-21S
NC-EWDP-22S
NC-EWDP-23S
NC-EWDP-8D
Felderhoff-25-1

En

closure 3